



LOW DROPOUT LINEAR REGULATOR

AZ1117B

General Description

The AZ1117B is a low dropout three-terminal regulator.

The AZ1117B has been optimized for low voltage where transient response and minimum input voltage are critical. It provides current limit and thermal shutdown. Its circuit includes a trimmed bandgap reference to assure output voltage accuracy to be within $\pm 1\%$. On-chip thermal shutdown provides protection against a combination of high current and ambient temperature that would create excessive junction temperature.

The AZ1117B is available in 1.2V, 1.5V, 1.8V, 2.5V, 3.3V, 5.0V fixed output voltage versions and ADJ output voltage version. The fixed versions integrate the adjust resistors. It is also available in an adjustable version which can set the output voltage with two external resistors.

The AZ1117B is available in the industry-standard SOT-223 and SOT-89 power packages.

Features

- Current Limit: 1.0A (Typ.)
- Output Noise from 10Hz to 10KHz: 0.003% of V_{OUT}
- PSRR at $I_{OUT}=300mA$ and $f=120Hz$: 70dB
- Output Voltage Accuracy: $\pm 1\%$
- On-chip Thermal Shutdown
- Maximum Quiescent Current: $I_{QMAX}=6mA$
- Operation Junction Temperature: -20 to $125^{\circ}C$

Applications

- USB Device
- Add-on Card
- DVD Player
- PC Motherboard

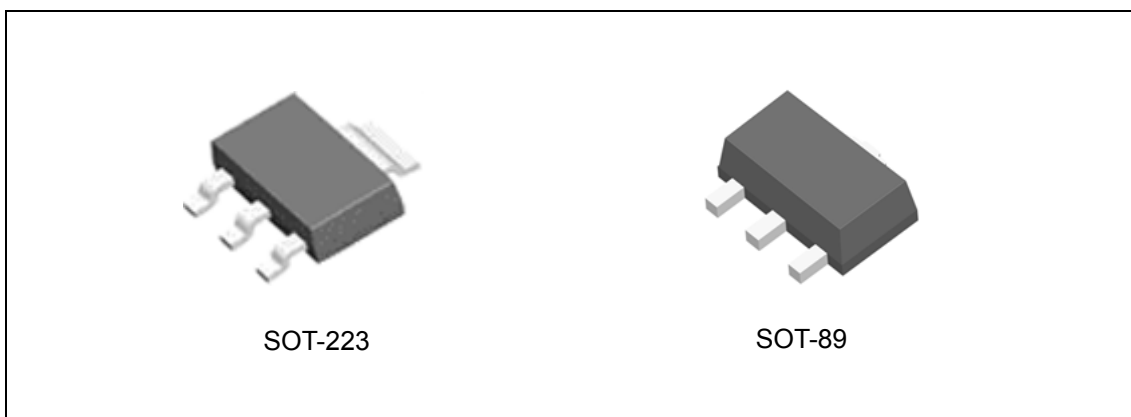


Figure 1. Package Type of AZ1117B



LOW DROPOUT LINEAR REGULATOR

AZ1117B

Pin Configuration



Figure 2. Pin Configuration of AZ1117B (Top View)

Functional Block Diagram

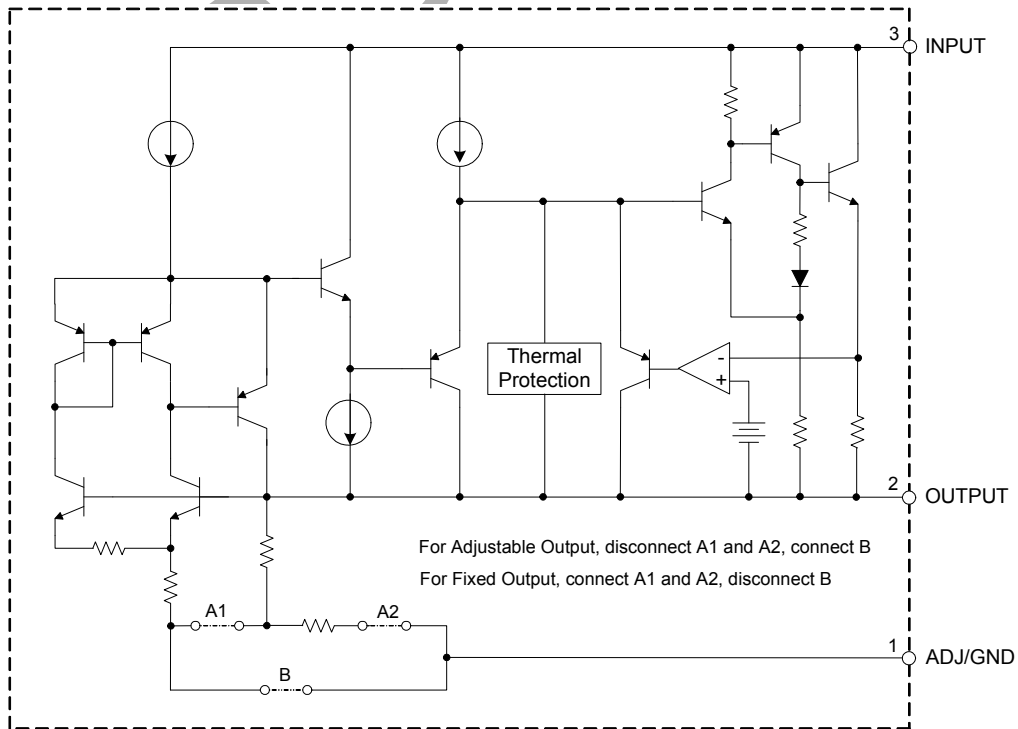


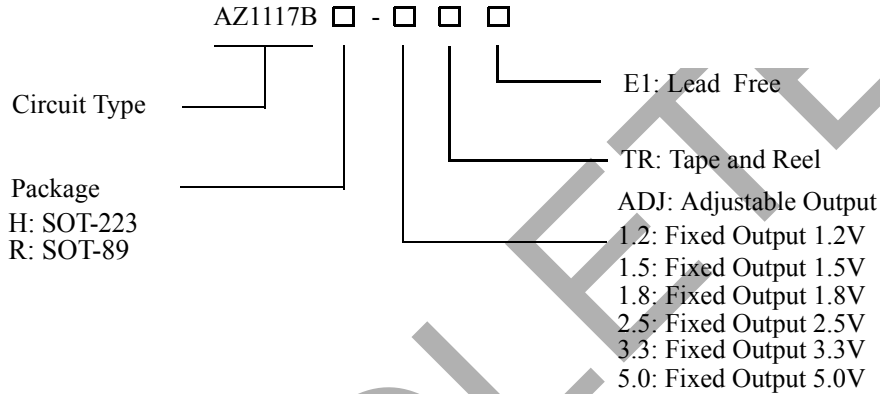
Figure 3. Functional Block Diagram of AZ1117B



LOW DROPOUT LINEAR REGULATOR

AZ1117B

Ordering Information



| Package | Temperature Range | Part Number | Marking ID | Packing Type |
|---------|-------------------|------------------|------------|--------------|
| SOT-223 | -20 to 125°C | AZ1117BH-ADJTRE1 | EH17K | Tape & Reel |
| | | AZ1117BH-1.2TRE1 | EH17P | Tape & Reel |
| | | AZ1117BH-1.5TRE1 | EH17Q | Tape & Reel |
| | | AZ1117BH-1.8TRE1 | EH17L | Tape & Reel |
| | | AZ1117BH-2.5TRE1 | EH17N | Tape & Reel |
| | | AZ1117BH-3.3TRE1 | EH17M | Tape & Reel |
| | | AZ1117BH-5.0TRE1 | EH17R | Tape & Reel |
| SOT-89 | -20 to 125°C | AZ1117BR-ADJTRE1 | E31F | Tape & Reel |
| | | AZ1117BR-1.2TRE1 | E31G | Tape & Reel |
| | | AZ1117BR-1.5TRE1 | E31H | Tape & Reel |
| | | AZ1117BR-1.8TRE1 | E31J | Tape & Reel |
| | | AZ1117BR-2.5TRE1 | E31K | Tape & Reel |
| | | AZ1117BR-3.3TRE1 | E31L | Tape & Reel |
| | | AZ1117BR-5.0TRE1 | E31M | Tape & Reel |

BCD Semiconductor's Pb-free products, as designated with "E1" suffix in the part number, are RoHS compliant.

**LOW DROPOUT LINEAR REGULATOR****AZ1117B****Absolute Maximum Ratings (Note 1)**

| Parameter | Symbol | Value | Unit |
|--------------------------------------|---------------|------------|------|
| Input Voltage | V_{IN} | 18 | V |
| Operating Junction Temperature Range | T_J | 150 | °C |
| Storage Temperature Range | T_{STG} | -65 to 150 | °C |
| Thermal Resistance (No Heatsink) | θ_{JA} | SOT-223 | 150 |
| | | SOT-89 | 210 |
| Lead Temperature (Soldering, 10sec) | T_{LEAD} | 260 | °C |

Note 1: Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

Recommended Operating Conditions

| Parameter | Symbol | Min | Max | Unit |
|--------------------------------------|----------|-----|-----|------|
| Input Voltage | V_{IN} | | 15 | V |
| Operating Junction Temperature Range | T_J | -20 | 125 | °C |


LOW DROPOUT LINEAR REGULATOR
AZ1117B
Electrical Characteristics
AZ1117B-ADJ Electrical Characteristics

 Operating Conditions: $V_{IN}=V_{OUT}+2V$, $I_{OUT}=10mA$, $T_J=25^{\circ}C$, unless otherwise specified. ($P \leq$ maximum power dissipation).

 Limits appearing in **Boldface** type apply over the entire junction temperature range for operation, $-20^{\circ}C$ to $125^{\circ}C$.

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit | |
|---------------------------------------|---------------|--|--------------|-------|--------------|---------------|---|
| Reference Voltage | V_{REF} | | 1.238 | 1.250 | 1.262 | V | |
| | | $1.5V \leq V_{IN} - V_{OUT} \leq 10V$ | 1.225 | 1.250 | 1.270 | | |
| Line Regulation | V_{RLINE} | $1.5V \leq V_{IN} - V_{OUT} \leq 10V$ | | 0.001 | 0.1 | % | |
| | | | | | 0.2 | | |
| Load Regulation | V_{RLOAD} | | | 0.4 | 1.0 | % | |
| Dropout Voltage | V_{DROP} | $\Delta V_{REF}=1\%$, $I_{OUT}=0.8A$ | SOT-223 | | 1.2 | 1.3 | V |
| | | | SOT-89 | | 1.2 | | |
| Current Limit | I_{LIMIT} | | 0.85 | 1 | 1.15 | A | |
| Adjust Pin Current | | | | 60 | 120 | μA | |
| Adjust Pin Current Change | | $1.5V \leq (V_{IN} - V_{OUT}) \leq 10V$ | | 0.2 | 5 | μA | |
| Minimum Load Current | | $1.5V \leq (V_{IN} - V_{OUT}) \leq 10V$ | | 1.7 | 5 | mA | |
| Ripple Rejection | PSRR | $f=120Hz$, $C_{OUT}=22\mu F$ $(V_{IN} - V_{OUT})=3V$, $I_{OUT}=300mA$ | | 70 | | dB | |
| Temperature Stability | | | | 0.5 | | % | |
| RMS Output Noise (% of V_{OUT}) | | $T_A=25^{\circ}C$, $10Hz \leq f \leq 10KHz$ | | 0.003 | | % | |
| Thermal Shutdown | | Junction Temperature | | 160 | | $^{\circ}C$ | |
| Thermal Shutdown Hysteresis | | | | 16 | | $^{\circ}C$ | |
| Thermal Resistance | θ_{JC} | SOT-223 | | 33 | | $^{\circ}C/W$ | |
| | | SOT-89 | | 39 | | | |

**LOW DROPOUT LINEAR REGULATOR****AZ1117B****Electrical Characteristics (Continued)****AZ1117B-1.2 Electrical Characteristics**

Operating Conditions: $V_{IN} \leq 10V$, $I_{OUT} = 10mA$, $T_J = 25^\circ C$, unless otherwise specified. ($P \leq$ maximum power dissipation). Limits appearing in **Boldface** type apply over the entire junction temperature range for operation, $-20^\circ C$ to $125^\circ C$.

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit | |
|---------------------------------------|---------------|--|--------------|-------|--------------|--------------|---|
| Output Voltage | V_{OUT} | | 1.176 | 1.2 | 1.224 | V | |
| | | $3.2V \leq V_{IN} \leq 10V$ | 1.152 | 1.2 | 1.228 | | |
| Line Regulation | V_{RLINE} | $1.5V \leq V_{IN} - V_{OUT} \leq 10V$ | | 0.5 | 6 | mV | |
| | | | | | 10 | | |
| Load Regulation | V_{RLOAD} | | | 2 | 15 | mV | |
| Dropout Voltage | V_{DROP} | $\Delta V_{OUT} = 1\%$, $I_{OUT} = 0.8A$ | SOT-223 | | 1.2 | 1.3 | V |
| | | | SOT-89 | | 1.2 | | |
| Current Limit | I_{LIMIT} | | 0.85 | 1 | 1.15 | A | |
| Quiescent Current | I_Q | $I_{OUT} = 0$ | | 4 | 6 | mA | |
| Ripple Rejection | PSRR | $f = 120Hz$, $C_{OUT} = 22\mu F$ $(V_{IN} - V_{OUT}) = 3V$, $I_{OUT} = 300mA$ | | 70 | | dB | |
| Temperature Stability | | | | 0.5 | | % | |
| RMS Output Noise (% of V_{OUT}) | | $T_A = 25^\circ C$, $10Hz \leq f \leq 10KHz$ | | 0.003 | | % | |
| Thermal Shutdown | | Junction Temperature | | 160 | | $^\circ C$ | |
| Thermal Shutdown Hysteresis | | | | 16 | | $^\circ C$ | |
| Thermal Resistance | θ_{JC} | SOT-223 | | 33 | | $^\circ C/W$ | |
| | | SOT-89 | | 39 | | | |

**LOW DROPOUT LINEAR REGULATOR****AZ1117B****Electrical Characteristics (Continued)****AZ1117B-1.5 Electrical Characteristics**

Operating Conditions: $V_{IN} \leq 10V$, $I_{OUT} = 10mA$, $T_J = 25^\circ C$, unless otherwise specified. ($P \leq$ maximum power dissipation). Limits appearing in **Boldface** type apply over the entire junction temperature range for operation, $-20^\circ C$ to $125^\circ C$.

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit | |
|---------------------------------------|---------------|--|--------------|-------|--------------|--------------|---|
| Output Voltage | V_{OUT} | | 1.485 | 1.5 | 1.515 | V | |
| | | $3.5V \leq V_{IN} \leq 10V$ | 1.470 | 1.5 | 1.530 | | |
| Line Regulation | V_{RLINE} | $1.5V \leq V_{IN} - V_{OUT} \leq 10V$ | | 0.5 | 6 | mV | |
| | | | | | 10 | | |
| Load Regulation | V_{RLOAD} | | | 2 | 15 | mV | |
| Dropout Voltage | V_{DROP} | $\Delta V_{OUT} = 1\%$, $I_{OUT} = 0.8A$ | SOT-223 | | 1.2 | 1.3 | V |
| | | | SOT-89 | | 1.2 | | |
| Current Limit | I_{LIMIT} | | 0.85 | 1 | 1.15 | A | |
| Quiescent Current | I_Q | $I_{OUT} = 0$ | | 4 | 6 | mA | |
| Ripple Rejection | PSRR | $f = 120Hz$, $C_{OUT} = 22\mu F$ $(V_{IN} - V_{OUT}) = 3V$, $I_{OUT} = 300mA$ | | 70 | | dB | |
| Temperature Stability | | | | 0.5 | | % | |
| RMS Output Noise (% of V_{OUT}) | | $T_A = 25^\circ C$, $10Hz \leq f \leq 10KHz$ | | 0.003 | | % | |
| Thermal Shutdown | | Junction Temperature | | 160 | | $^\circ C$ | |
| Thermal Shutdown Hysteresis | | | | 16 | | $^\circ C$ | |
| Thermal Resistance | θ_{JC} | SOT-223 | | 33 | | $^\circ C/W$ | |
| | | SOT-89 | | 39 | | | |

**LOW DROPOUT LINEAR REGULATOR****AZ1117B****Electrical Characteristics (Continued)****AZ1117B-1.8 Electrical Characteristics**

Operating Conditions: $V_{IN} \leq 10V$, $I_{OUT} = 10mA$, $T_J = 25^\circ C$, unless otherwise specified. ($P \leq$ maximum power dissipation). Limits appearing in **Boldface** type apply over the entire junction temperature range for operation, $-20^\circ C$ to $125^\circ C$.

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit | |
|---------------------------------------|---------------|--|--------------|-------|--------------|--------------|---|
| Output Voltage | V_{OUT} | | 1.782 | 1.8 | 1.818 | V | |
| | | $3.8V \leq V_{IN} \leq 10V$ | 1.764 | 1.8 | 1.836 | | |
| Line Regulation | V_{RLINE} | $1.5V \leq V_{IN} - V_{OUT} \leq 10V$ | | 0.5 | 6 | mV | |
| | | | | | 10 | | |
| Load Regulation | V_{RLOAD} | | | 2 | 15 | mV | |
| Dropout Voltage | V_{DROP} | $\Delta V_{OUT} = 1\%$, $I_{OUT} = 0.8A$ | SOT-223 | | 1.2 | 1.3 | V |
| | | | SOT-89 | | 1.2 | | |
| Current Limit | I_{LIMIT} | | 0.85 | 1 | 1.15 | A | |
| Quiescent Current | I_Q | $I_{OUT} = 0$ | | 4 | 6 | mA | |
| Ripple Rejection | PSRR | $f = 120Hz$, $C_{OUT} = 22\mu F$ $(V_{IN} - V_{OUT}) = 3V$, $I_{OUT} = 300mA$ | | 70 | | dB | |
| Temperature Stability | | | | 0.5 | | % | |
| RMS Output Noise (% of V_{OUT}) | | $T_A = 25^\circ C$, $10Hz \leq f \leq 10KHz$ | | 0.003 | | % | |
| Thermal Shutdown | | Junction Temperature | | 160 | | $^\circ C$ | |
| Thermal Shutdown Hysteresis | | | | 16 | | $^\circ C$ | |
| Thermal Resistance | θ_{JC} | SOT-223 | | 33 | | $^\circ C/W$ | |
| | | SOT-89 | | 39 | | | |

**LOW DROPOUT LINEAR REGULATOR****AZ1117B****Electrical Characteristics (Continued)****AZ1117B-2.5 Electrical Characteristics**

Operating Conditions: $V_{IN} \leq 10V$, $I_{OUT} = 10mA$, $T_J = 25^\circ C$, unless otherwise specified. ($P \leq$ maximum power dissipation). Limits appearing in **Boldface** type apply over the entire junction temperature range for operation, $-20^\circ C$ to $125^\circ C$.

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit | |
|---------------------------------------|---------------|--|--------------|------------|--------------|--------------|---|
| Output Voltage | V_{OUT} | | 2.475 | 2.5 | 2.525 | V | |
| | | $4.5V \leq V_{IN} \leq 10V$ | 2.455 | 2.5 | 2.545 | | |
| Line Regulation | V_{RLINE} | $1.5V \leq V_{IN} - V_{OUT} \leq 10V$ | | 0.5 | 6 | mV | |
| | | | | | 10 | | |
| Load Regulation | V_{RLOAD} | | | 2 | 15 | mV | |
| Dropout Voltage | V_{DROP} | $\Delta V_{OUT} = 1\%$, $I_{OUT} = 0.8A$ | SOT-223 | | 1.2 | 1.3 | V |
| | | | SOT-89 | | 1.2 | | |
| Current Limit | I_{LIMIT} | | 0.85 | 1 | 1.15 | A | |
| Quiescent Current | I_Q | $I_{OUT} = 0$ | | 4 | 6 | mA | |
| Ripple Rejection | PSRR | $f = 120Hz$, $C_{OUT} = 22\mu F$ $(V_{IN} - V_{OUT}) = 3V$, $I_{OUT} = 300mA$ | | 70 | | dB | |
| Temperature Stability | | | | 0.5 | | % | |
| RMS Output Noise (% of V_{OUT}) | | $T_A = 25^\circ C$, $10Hz \leq f \leq 10KHz$ | | 0.003 | | % | |
| Thermal Shutdown | | Junction Temperature | | 160 | | $^\circ C$ | |
| Thermal Shutdown Hysteresis | | | | 16 | | $^\circ C$ | |
| Thermal Resistance | θ_{JC} | SOT-223 | | 33 | | $^\circ C/W$ | |
| | | SOT-89 | | 39 | | | |

**LOW DROPOUT LINEAR REGULATOR****AZ1117B****Electrical Characteristics (Continued)****AZ1117B-3.3 Electrical Characteristics**

Operating Conditions: $V_{IN} \leq 10V$, $I_{OUT} = 10mA$, $T_J = 25^\circ C$, unless otherwise specified. ($P \leq$ maximum power dissipation). Limits appearing in **Boldface** type apply over the entire junction temperature range for operation, $-20^\circ C$ to $125^\circ C$.

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit | |
|---------------------------------------|---------------|--|--------------|-------|--------------|--------------|---|
| Output Voltage | V_{OUT} | | 3.267 | 3.3 | 3.333 | V | |
| | | $5.3V \leq V_{IN} \leq 10V$ | 3.235 | 3.3 | 3.365 | | |
| Line Regulation | V_{RLINE} | $1.5V \leq V_{IN} - V_{OUT} \leq 10V$ | | 0.5 | 6 | mV | |
| | | | | | 10 | | |
| Load Regulation | V_{RLOAD} | | | 2 | 15 | mV | |
| Dropout Voltage | V_{DROP} | $\Delta V_{OUT} = 1\%$, $I_{OUT} = 0.8A$ | SOT-223 | | 1.2 | 1.3 | V |
| | | | SOT-89 | | 1.2 | | |
| Current Limit | I_{LIMIT} | | 0.85 | 1 | 1.15 | A | |
| Quiescent Current | I_Q | $I_{OUT} = 0$ | | 4 | 6 | mA | |
| Ripple Rejection | PSRR | $f = 120Hz$, $C_{OUT} = 22\mu F$ $(V_{IN} - V_{OUT}) = 3V$, $I_{OUT} = 300mA$ | | 70 | | dB | |
| Temperature Stability | | | | 0.5 | | % | |
| RMS Output Noise (% of V_{OUT}) | | $T_A = 25^\circ C$, $10Hz \leq f \leq 10KHz$ | | 0.003 | | % | |
| Thermal Shutdown | | Junction Temperature | | 160 | | $^\circ C$ | |
| Thermal Shutdown Hysteresis | | | | 16 | | $^\circ C$ | |
| Thermal Resistance | θ_{JC} | SOT-223 | | 33 | | $^\circ C/W$ | |
| | | SOT-89 | | 39 | | | |

**LOW DROPOUT LINEAR REGULATOR****AZ1117B****Electrical Characteristics (Continued)****AZ1117B-5.0 Electrical Characteristics**

Operating Conditions: $V_{IN} \leq 10V$, $I_{OUT} = 10mA$, $T_J = 25^\circ C$, unless otherwise specified. ($P \leq$ maximum power dissipation). Limits appearing in **Boldface** type apply over the entire junction temperature range for operation, $-20^\circ C$ to $125^\circ C$.

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit | |
|---------------------------------------|---------------|--|--------------|-------|--------------|--------------|---|
| Output Voltage | V_{OUT} | | 4.950 | 5.0 | 5.050 | V | |
| | | $6.5V \leq V_{IN} \leq 10V$ | 4.900 | 5.0 | 5.100 | | |
| Line Regulation | V_{RLINE} | $1.5V \leq V_{IN} - V_{OUT} \leq 10V$ | | 0.5 | 6 | mV | |
| | | | | | 10 | | |
| Load Regulation | V_{RLOAD} | | | 2 | 15 | mV | |
| Dropout Voltage | V_{DROP} | $\Delta V_{OUT} = 1\%$, $I_{OUT} = 0.8A$ | SOT-223 | | 1.2 | 1.3 | V |
| | | | SOT-89 | | 1.2 | | |
| Current Limit | I_{LIMIT} | | 0.85 | 1 | 1.15 | A | |
| Quiescent Current | I_Q | $I_{OUT} = 0$ | | 4 | 6 | mA | |
| Ripple Rejection | PSRR | $f = 120Hz$, $C_{OUT} = 22\mu F$ $(V_{IN} - V_{OUT}) = 3V$, $I_{OUT} = 300mA$ | | 70 | | dB | |
| Temperature Stability | | | | 0.5 | | % | |
| RMS Output Noise (% of V_{OUT}) | | $T_A = 25^\circ C$, $10Hz \leq f \leq 10KHz$ | | 0.003 | | % | |
| Thermal Shutdown | | Junction Temperature | | 160 | | $^\circ C$ | |
| Thermal Shutdown Hysteresis | | | | 16 | | $^\circ C$ | |
| Thermal Resistance | θ_{JC} | SOT-223 | | 33 | | $^\circ C/W$ | |
| | | SOT-89 | | 39 | | | |



LOW DROPOUT LINEAR REGULATOR

AZ1117B

Typical Performance Characteristics

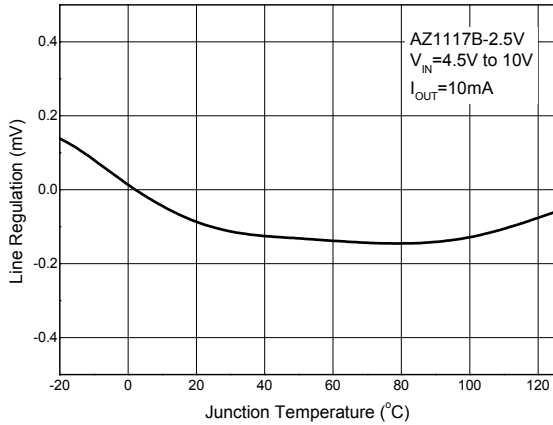


Figure 4. Line Regulation vs. Junction Temperature

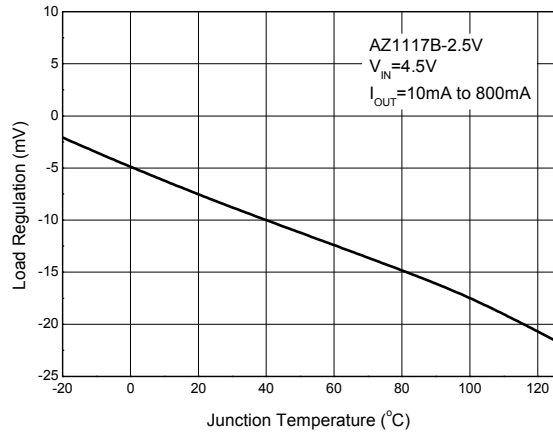


Figure 5. Load Regulation vs. Junction Temperature

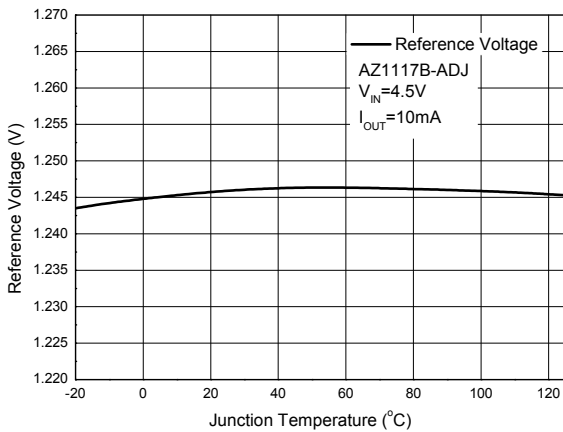


Figure 6. Reference Voltage vs. Junction Temperature

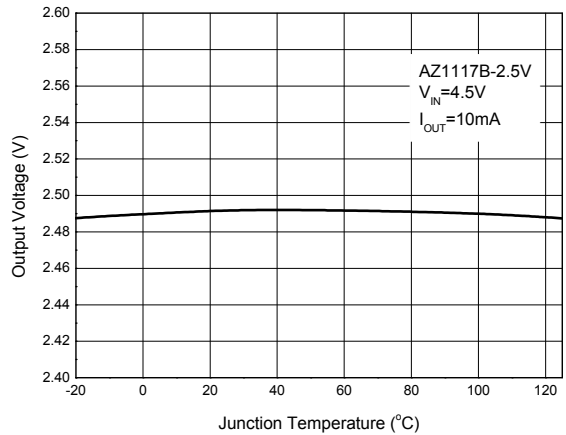


Figure 7. Output Voltage vs. Junction Temperature



LOW DROPOUT LINEAR REGULATOR

AZ1117B

Typical Performance Characteristics (Continued)

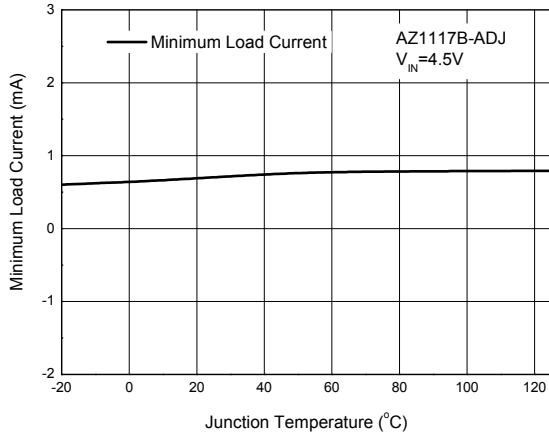


Figure 8. Minimum Load Current vs. Junction Temperature

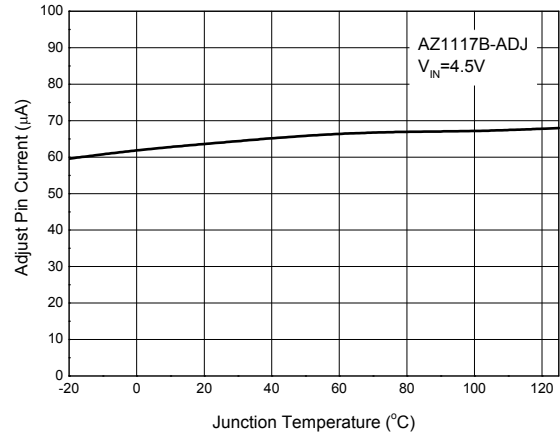


Figure 9. Adjust Pin Current vs. Junction Temperature

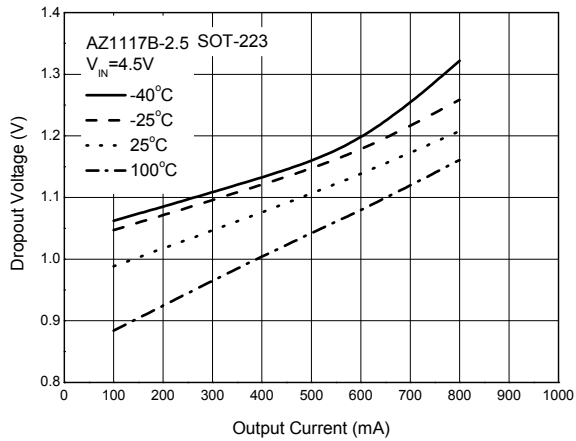


Figure 10. Dropout Voltage vs. Output Current

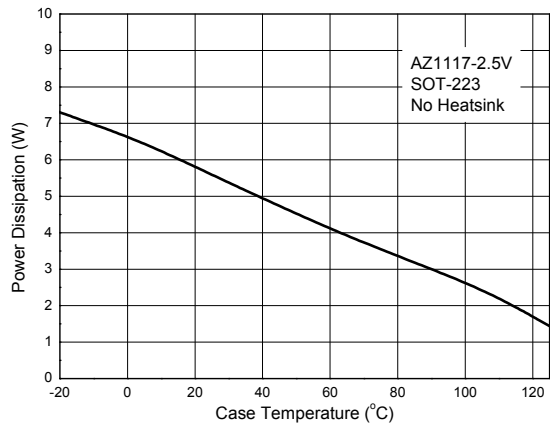


Figure 11. Power Dissipation vs. Case Temperature



LOW DROPOUT LINEAR REGULATOR

AZ1117B

Typical Performance Characteristics (Continued)

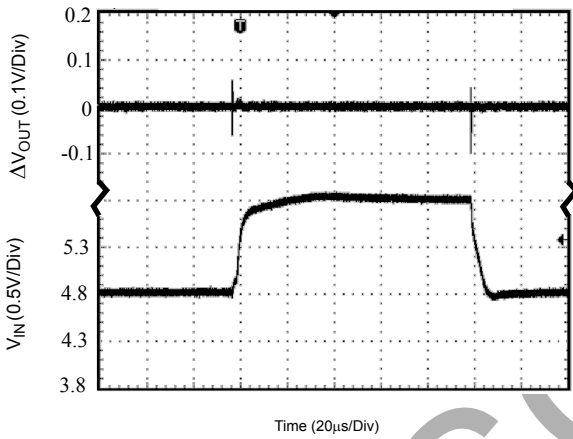


Figure 12. Line Transient Response

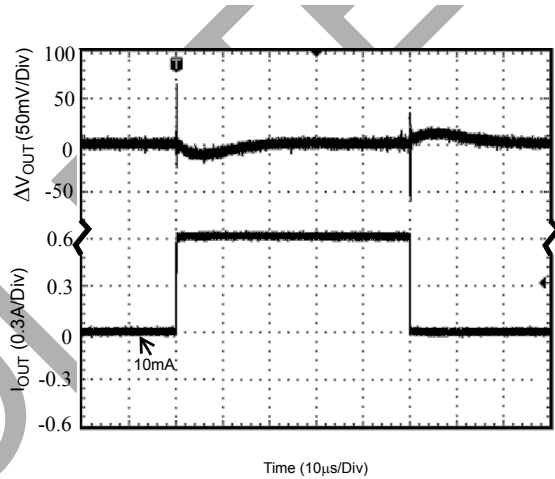


Figure 13. Load Transient Response

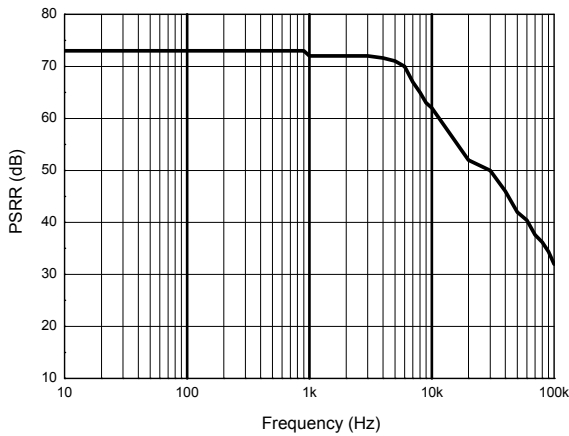


Figure 14. PSRR vs. Frequency

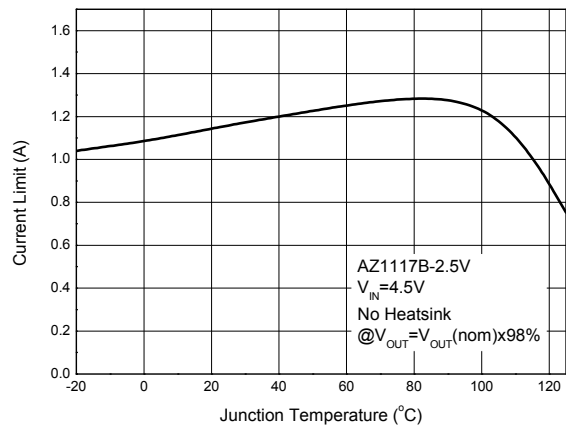


Figure 15. Current Limit vs. Junction Temperature



LOW DROPOUT LINEAR REGULATOR

AZ1117B

Typical Performance Characteristics (Continued)

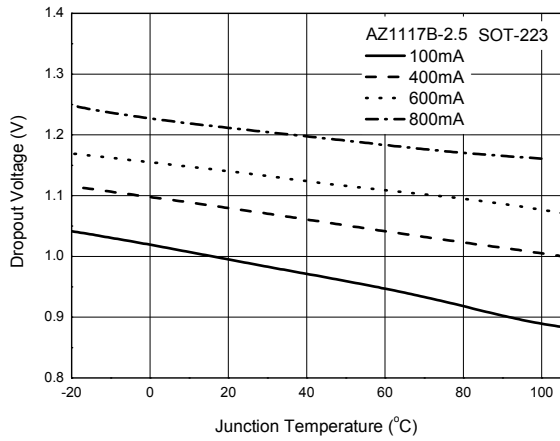


Figure 16. Dropout Voltage vs. Junction Temperature



LOW DROPOUT LINEAR REGULATOR

AZ1117B

Typical Applications

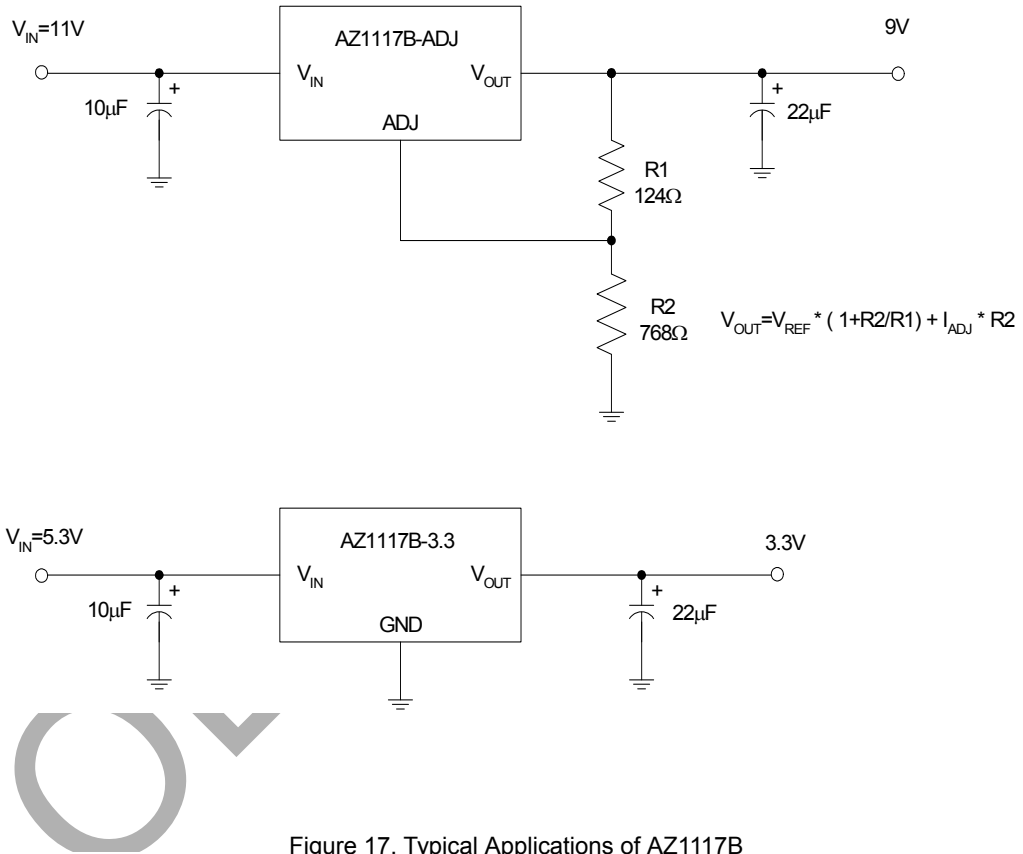


Figure 17. Typical Applications of AZ1117B



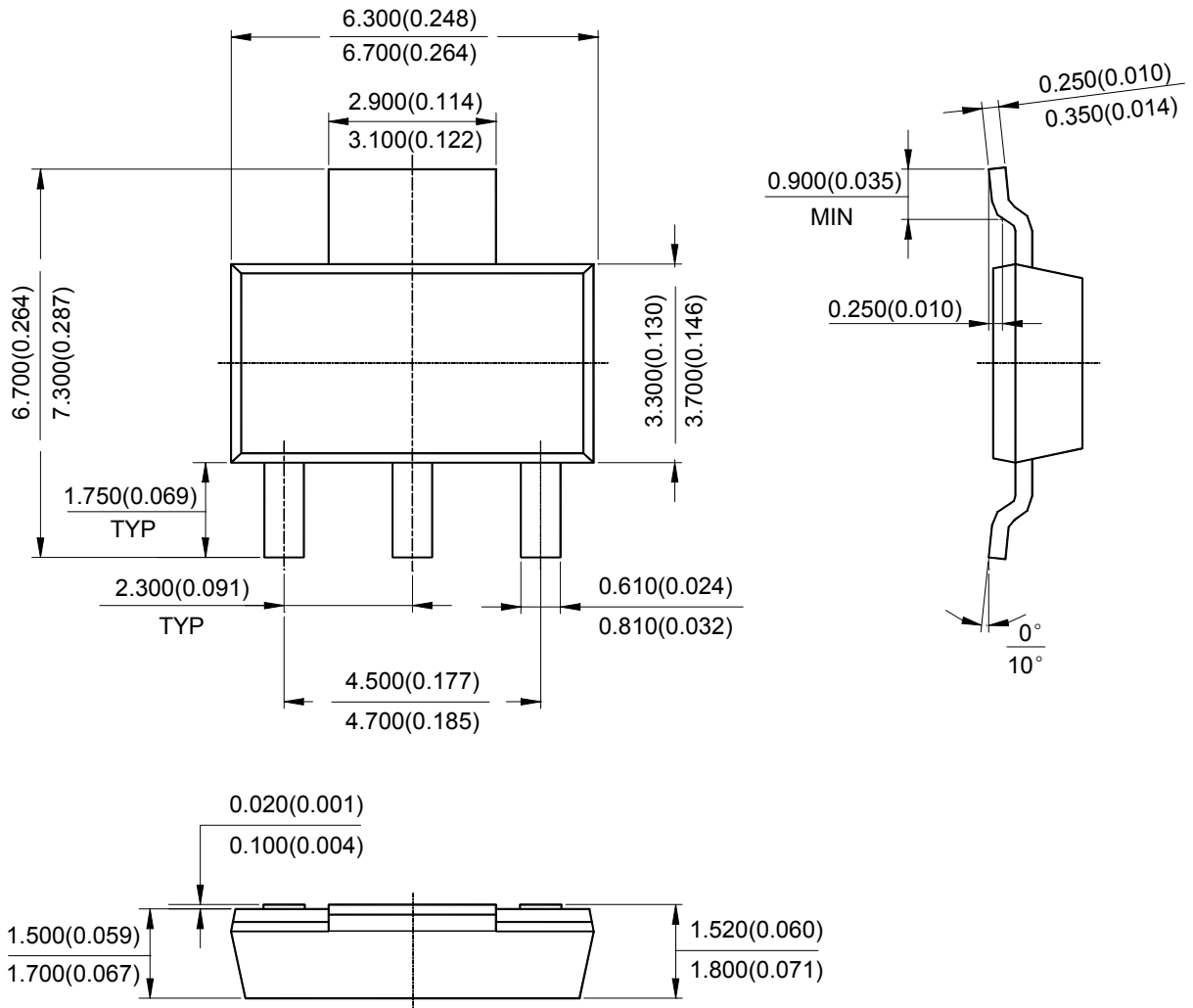
LOW DROPOUT LINEAR REGULATOR

AZ1117B

Mechanical Dimensions

SOT-223

Unit: mm(inch)



Part Obsolete



BCD Semiconductor Manufacturing Limited

<http://www.bcdsemi.com>

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